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Few students of mathematics have any conception of the beauty or difficulty of certain problems arising in actual business transactions.

But an intense arithmetic appreciation of the important relations underlying annuities and perpetuities will go far toward equipping a student to solve problems of this kind.

BOOK REVIEW.

SEND ALL COMMUNICATIONS ABOUT BOOKS TO W. H. BUSSEY, University of Minnesota.

Introduction to Mathematical Statistics. By CARL J. WEST, Ph.D., Assistant Professor of Mathematics, Ohio State University. R. G. Adams and Co., Columbus, 1918.

In spite of the wide divergence between the original sources and purposes of mathematical statistics, the present development of the subject seems to be along two main lines—that is, either it presents statistical information consisting usually of numerical measurements in a form easily and quickly interpreted by the eye, or it derives and applies formulas for the purpose of measuring various phenomena presented by the measurements.

The first line of development calls for very elementary mathematical knowledge and has been well treated by several authors, especially Brinton. The second line of development has been treated in its various phases in scientific journals and a few English and German books; it involves mathematical principles ranging from the most elementary to the most abstruse but was never presented by an American statistician in approximately complete form until Dr. West's *Introduction to Mathematical Statistics* appeared. The usefulness of the German books in this country is impaired by the language while all the other foreign books on the subject are too voluminous to be used as textbooks in American colleges.

As may be expected, Dr. West's book gives a treatment of both lines of development and, considering the great amount of literature of the second kind in various scientific journals, shows good judgment in the selection of important principles. No doubt, Dr. West's book will be widely used—especially as a textbook in colleges—with few rivals for many years to come, although any author of a statistical textbook would merit considerable praise even though he did little more than encourage wider study and help to standardize methods.

The reviewer agrees with Dr. West in most of his introductory statements but insists that a knowledge of at least the calculus is indispensable to a full understanding of the principles involved in the second line of development mentioned above, especially the work of Pearson and his followers, some of which is treated by Dr. West.

The printers show a lack of experience with scientific books or else the proof was not carefully read; the alignment is poor in places—for example, letters are out of line in eighteen different places on page 18—and typographical errors are fairly frequent.

A few paragraphs are poorly written. For example, the last paragraph on page 131 is surely not in the form intended. Also, the expression *Since a_1 and a_2 are not integers,* in the last paragraph on page 135, seems to be out of place. The repetition of the formula for K on page 138 seems unnecessary—it is given on the preceding page. The formulas for S_3, S_4 and S_5 on page 98 are almost too badly mixed and the expression for $1/y \cdot dy/dx$ in terms of the moments is almost too poorly aligned to be unravelled by the student. But the trouble in both cases is typographical.

The latter part of the book is a little too condensed, especially the part of the appendix devoted to the Pearson types of frequency curves, which cannot be used except for purposes of reference unless supplemented by explanations and illustrations by an experienced instructor. Reference should have been made to the types of curves recently developed by Pearson as well as to the interesting abacus given in Pearson's Tables to be used in distinguishing the various types.

The treatment of the various kinds of averages is good although the reviewer believes that the weighted arithmetic average should be regarded as a special form of the ordinary arithmetic average—where the various conceptions of *weight* take the place of *frequencies.*

Correlation theory is treated at great length, as it deserves, although the important correlation surface and its equation, with its important relation to the correlation coefficient, is unfortunately omitted in order to avoid more advanced mathematical principles. The distinction between the correlation coefficient and the correlation ratio is well explained.

Most of the errors found in the book are trivial and of the kind which it is almost impossible to avoid in a book dealing with a virgin field. On the whole, Dr. West's book promises to fill well the long felt want for a textbook on mathematical statistics and no longer need instructors depend solely upon their own notes and lectures. The fact that the book is well provided with good examples should make it especially successful as a text-book.

C. H. FORSYTH.

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PROBLEMS FOR SOLUTION.

SEND ALL COMMUNICATIONS ABOUT PROBLEMS TO B. F. FINKEL, Springfield, Missouri.

It is to be understood that problems proposed for solution or solutions of problems which have been proposed in the MONTHLY are welcomed from all readers, whether subscribers or not. Single copies containing these problems or solutions will be sent to those contributing, provided their addresses are known to the Secretary of the Association.

2727. Proposed by H. J. WOODALL, Stockport, England.

Having given $2^k \equiv +k \pmod{p}$ and ξ the haupt-exponent of 2 for mod p (ξ is the least power of 2 whose residue, for modulus p, is plus unity) solve $x \cdot 2^x + 1 \equiv 0 \pmod{p}$.